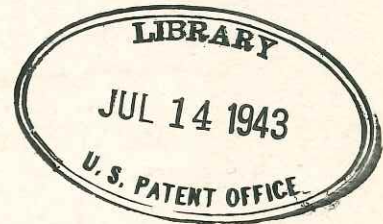


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Digest Return to Div 9

Instructions For Installing And Operating Molten-Salt Pumps

Class APR



Return

MAR 2 1956
PAT DIV 9

This instruction book has been prepared to assist users of Ingersoll-Rand type APR molten-salt pumps in their installation, operation and maintenance. Since individual units vary as to length of column, method of support and drive, it must be understood that the sectional drawings included in this book are representative only. The specific sectional assembly and elevation drawings furnished with the unit should be used for accurate details. The company will gladly advance any specific information not included in the following pages. Address the nearest Ingersoll-Rand branch office as listed on the last page of this book.

Form IB-3125.15

Ingersoll-Rand

Cameron Pump Division
11 BROADWAY, NEW YORK CITY

(4)

INSTRUCTIONS FOR INSTALLATION AND OPERATION

General Design

These pumps are designed for vertical operation on molten salt service, and consist of a pumping element suspended in a vertical column. There is an outer column through which the liquid flows upward from the impeller and an inner column which contains the intermediate bearings and prevents hot salt from reaching the packing. The pumping element is assembled as a self-contained unit, consisting of the suction-head, impeller, pump casing and the lower section of shaft.

The outer column sections are connected by flanges having rabbeted fits to assure alignment in assembly. The inner column is divided into suitable lengths which are coupled by means of the intermediate bearing bushings, the ends of which are threaded for that purpose. The shaft sections are joined with threaded couplings, the threads being such that the driver torque tightens the joint. NOTE:—While reverse flow at shut down may cause reverse rotation of the unit, this torque is applied at the lower end of the pump and hence also tightens the shaft couplings.

The pump is supported from the supporting-head plate which is mounted on suitable structural-steel supports. The driver is mounted on a supporting head above the discharge head. A stuffing box on the upper side of the discharge head seals the shaft against dirt and air from the outside and the salt steam blanket on the inside. The bearings are of the radial, steady-rest type, the thrust load and rotor weight being carried by the driver thrust bearing.

Drivers

These pumps may be driven by an electric motor, right angle gear or steam turbine. Any type of driver which is used must be suitable for carrying the total thrust load of the pump. A rigid adjustable coupling is used between the driver and pump, and vertical adjustment is made in the coupling.

Installation

Supporting-plate details and general dimensions are shown on the certified elevation drawing. The pump is shipped completely assembled. Lower the unit into the tank until the supporting plate rests on the structural-steel supports. Plumb the pump by leveling the supporting plate, using shims between the supporting plate and the supporting steel if necessary. Align the discharge piping so that minimum strain will be placed on the pump when the flange is bolted up.

Mounting the Driver

Place the pump half-coupling on the pump shaft and screw the shaft-adjusting nut all the way down on its thread. Mount the driver half-coupling on the driver shaft and tighten the coupling nut. Place the driver on the supporting head so that it fits in the counterbore and pull up the driver bolts snug. IMPORTANT—Before inserting any coupling bolts, check the driver rotation. This must coincide with the direction arrow on the pump. Reverse driver rotation will cause the shaft couplings to back off and may cause serious damage to the pump. When the pump is uncoupled the impeller rests against the suction head and will not be free to turn. Before operating the unit the entire pump rotor must be raised to provide clearance between the impeller and the suction head. The shaft-adjusting nut on the rigid coupling has been designed for this purpose. To adjust and connect the coupling, back off the adjusting nut (69) until it contacts the driver half-coupling, making sure it enters the counterbore. Then screw the adjusting nut down on the shaft until there is a $\frac{1}{16}$ " gap between the top of the adjusting nut and the lower face of the driver coupling. To make this measurement slide the pump half-coupling up against the adjusting nut, making sure it enters the counterbore and measure the gap at the coupling rims. Repeat if necessary until the gap is $\frac{1}{16}$ " as measured at the coupling rims. Then line up the holes and insert the short coupling bolts which hold the adjusting nut to the driver half-coupling. Draw up these bolts gradually, raising the pump rotor. When the adjusting nut is tight against the driver half-coupling, slide up the pump half-coupling making sure the counterbore fits over the adjusting nut and insert the through bolts. The pump shaft should now be centered in the stuffing box by shifting the position of the driver if necessary. Pull down the driver bolts and if the pump shaft is still centered in the stuffing box, dowel the driver in position.

Operation

Pack the pump stuffing box. As this packing merely seals the steam blanket and prevents dirt from entering the inner column, it should not be drawn up tightly. Turn the pump over by hand several revolutions to make sure that no solid salt is interfering with the rotation of the unit. IMPORTANT—Never start a motor-driven unit against a closed discharge valve. Such procedure will cause severe hydraulic shock and will result in a sprung shaft. The discharge valve must be at

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least $\frac{1}{3}$ open when starting. When switching pumps, this means that there will be temporary backflow through the idle unit. This may cause reverse rotation of the unit but this will do no harm to pump or motor. Turbine-driven units should be brought up to speed slowly and, if handled this way, may be started against a closed discharge valve. When shutting down the unit, the discharge valve may be closed prior to shut down if desired.

Dismantling and Assembly

The procedure to be followed in dismantling and reassembly will be apparent from studying the sectional assembly drawings and descriptive matter. The impeller is a slide fit on the shaft, and is held in place with a shaft nut (left-hand thread). The shaft sections are held together with shaft couplings (left-hand threads).

Spare Parts

The following spare parts should be available for repairs:

- 1 Shaft sleeve (part 8)
- 1 Set column bearing bushings (part 121)
- 1 Set column bearing journal sleeves (part 135A)
- 1 Suction head bearing lining (part 137)
- 1 Suction head journal sleeve (part 135)
- 1 Casing bearing lining (part 137A)
- 1 Casing bearing journal sleeve (part 135A)
- 1 Set packing (part 64)

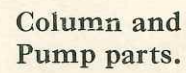
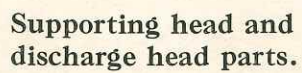
When ordering spare parts the information listed below should be given:

- 1. Serial number of the pump as given on the pump name plate.
- 2. Size and type of the pump as given on the pump name plate.
- 3. Number of the part as listed.
- 4. Name of the part as listed.
- 5. When possible, give complete symbols stamped on the old part.

APR Pump Part List

Part No.	Name of Part	Part No.	Name of Part
1	Casing	137A	Bearing lining—casing
3	Propeller	157	Flinger
8	Shaft sleeve	164	Coupling nut
10	Shaft—motor end	164A	Shaft coupling nut
10A	Shaft—upper intermediate	172	Supporting head
10B	Shaft—lower intermediate	191	Inner column adapter sleeve
10C	Shaft—pump end	241	Lockwasher
16	Gland—2 halves	264	Stuffing box extension
34	Coupling—pump half	312	Locking collar
34A	Coupling—motor half	312A	Locking collar
64	Packing	360	Suction head
69	Shaft adjusting nut	361	Discharge head
110	Bearing support	423	Outer column—lower
121	Bearing bushing—inner column	423A	Outer column—upper
126	Shaft nut	424	Inner column—lower
135	Journal sleeve—suct. head	424A	Inner column—intermediate
135A	Journal sleeve—casing to bearing bushing	424B	Inner column—upper
137	Bearing lining—suction head		

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